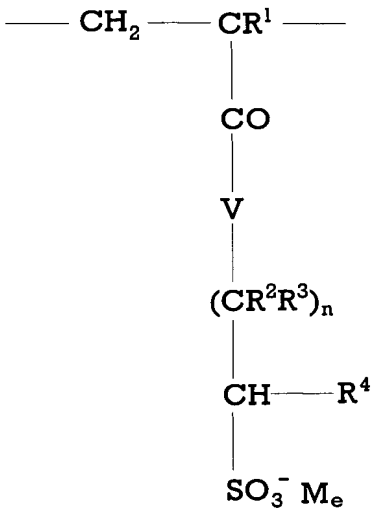
We Claim:

1. A method of making a reduced fluid loss post-tensioned hydraulic cementitious grout article comprising:

inserting at least one bar member into a channel; securing a first end of the bar member; stretching the bar member; securing a second end of the bar member; introducing into the channel a reduced fluid loss hydraulic cementitious grout composition comprising hydraulic cement, water, and a copolymer, wherein the copolymer comprises at least two components selected from a), b) and c):

wherein a) is the component



(Formula I)

wherein R^1 = is at least one of hydrogen or methyl;

R^2, R^3, R^4 = are each independently hydrogen, aliphatic hydrocarbon radical with 1 to about 6 carbon atoms, or phenyl radical;

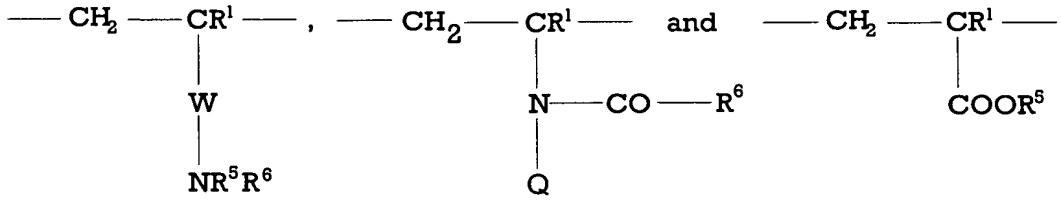
V = NH or oxygen;

M = hydrogen, monovalent metal cation, bivalent metal cation, ammonium, or an organic amino radical;

n = about 1 to about 5;

e = 0.5 or 1;

b) is at least one component selected from the group consisting of



(Formula II) (Formula III) (Formula IV)

wherein W = -CO-, -CO-$(CH_2)_x$-, -CO-NR^2-$(CH_2)_x$-;

R^1= is at least one of hydrogen or methyl;

R^2= hydrogen, aliphatic hydrocarbon radical with 1 to about 6 carbon-atoms, or phenyl radical;

x = about 1 to about 6;

R^5 and R^6 = are each independently hydrogen, alkyl group containing 1 to about 4 carbon atoms, aliphatic hydrocarbon radical containing 1 to about 20 carbon atoms, alicyclic hydrocarbon radical containing about 5 to about 8 carbon atoms, or aryl radical containing about 6 to about 14 carbon atoms;

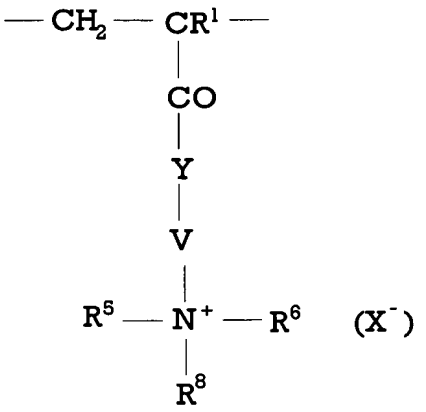
Q = hydrogen or $-CHR^5R^7$;

R^7 = hydrogen, aliphatic hydrocarbon radical containing 1 to about 4 carbon atoms, -COOH or $-COOM_a$;

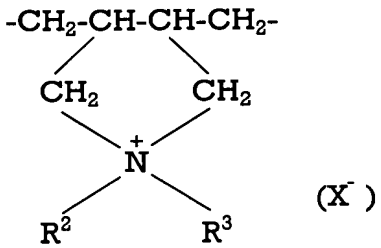
M = hydrogen, monovalent metal cation, bivalent metal cation, ammonium, or an organic amino radical;

a = 0.5 or 1;

c) is at least one component selected from the group consisting of



(Formula V) and

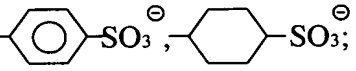


(Formula VI)

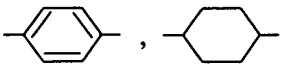
wherein R^1 = is at least one of hydrogen or methyl;

R^2 and R^3 = are each independently hydrogen, aliphatic hydrocarbon radical with 1 to about 6 carbon-atoms, or phenyl radical;

R^5 and R^6 = are each independently hydrogen, alkyl group containing 1 to about 4 carbon atoms, aliphatic hydrocarbon radical containing 1 to about 20 carbon atoms, alicyclic hydrocarbon radical containing about 5 to about 8 carbon atoms, or aryl radical containing about 6 to about 14 carbon atoms;

R^8 = R^5 or R^6, $-(CH_2)_x-SO_3^{\ominus}(M)$,  ;

Y = O, NH or NR^5;

V = $-(CH_2)_x-$,  ;

X = halogen, C_1- to C_4-alkylsulfate or C_1- to C_4-alkylsulfonate; and

M = hydrogen, monovalent metal cation, bivalent metal cation, ammonium, or an organic amino radical.

2. A reduced fluid loss post-tensioned hydraulic cementitious grout article produced by the method of claim 1.

3. The reduced fluid loss post-tensioned hydraulic cementitious grout article of claim 2, wherein the reduced fluid loss post-tensioned hydraulic cementitious grout article is a reduced fluid loss post-tensioned tendon.

4. A concrete member comprising the reduced fluid loss post-tensioned hydraulic cementitious grout article of claim 2.

5. The method of claim 1, wherein the bar member is at least one of bars, rods, strands, or cables.

6. The method of claim 1, wherein if R^5 or R^6 is an aliphatic hydrocarbon radical at least one aliphatic hydrocarbon radical of the copolymer comprises a substituent that is at least one of a hydroxyl group, alkyl group containing 1 to about 6 carbon atoms, carboxyl group or sulfonic group.

7. The method of claim 1, wherein if R^5 or R^6 is an alicyclic hydrocarbon radical at least one alicyclic hydrocarbon radical of the copolymer comprises a substituent that is at least one of a hydroxyl group, alkyl group containing 1 to about 6 carbon atoms, carboxyl group or sulfonic group.

8. The method of claim 1, wherein if R^5 or R^6 is an aryl radical at least one aryl radical of the copolymer comprises a substituent that is at least one of a hydroxyl group, alkyl group containing 1 to about 6 carbon atoms, carboxyl group or sulfonic group.

9. The method of claim 1, wherein if R^2, R^3, or R^4 is a phenyl radical at least one phenyl radical of the copolymer comprises a substituent that is at least one of a hydroxyl group, alkyl group containing 1 to about 6 carbon atoms, carboxyl group or sulfonic group.

10. The method of claim 1, wherein if M is an organic amino radical at least one organic amino radical of the copolymer comprises a substituent that is at

least one of a hydroxyl group, alkyl group containing 1 to about 6 carbon atoms, carboxyl group or sulfonic group.

11. The method of claim 1, wherein if M is an organic amino radical at least one organic amino radical of the copolymer comprises substituted ammonium groups derived from the group consisting of primary, secondary or tertiary C_1 to C_{20} alkylamines; primary, secondary or tertiary C_1 to C_{20} alkanolamines; primary, secondary or tertiary C_5 to C_8 cycloalkylamines; and, primary, secondary or tertiary C_6 to C_{14} arylamines.

12. The method of claim 1, wherein if M is a monovalent metal cation the monovalent metal cation is at least one of sodium, lithium, or potassium ions.

13. The method of claim 1, wherein if M is a bivalent metal cation the bivalent metal cation is at least one of calcium or magnesium ions.

14. The method of claim 1, wherein X is an anion of at least one of chlorine, bromine, sulfate or methyl sulfate.

15. The method of claim 1, wherein the sulfonic acid of formula I is replaced with at least one of methallylsulfonic acid or allyl sulfonic acid.

16. The method of claim 1, wherein the copolymer includes at least one of N,N, dimethylacrylamide and 2-acrylamido, 2-methyl propane sulfonic acid.

17. The method of claim 1 wherein the copolymer comprises a d) component that is at least one compound selected from the group consisting of diacrylate ester of ethylene glycol, dimethylacrylate ester of ethylene glycol, polypropylene glycol, block copolymers of ethylene glycol, block copolymers of propylene glycol, diallyl ether of ethylene glycol, diallyl ether of propylene glycol, divinyl ether of ethylene glycol, divinyl ether of

propylene glycol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, N, N'-methylene-bis-acrylamide, N,N'-methylene-bis-methacrylamide, trimethylolpropane, triacrylate, triallyl isocyanurate, and mixtures thereof.

18. The method of claim 17 wherein the copolymer comprises about 0.0001 mole percent to about 50 mole percent of the d) component.

19. The method of claim 17 wherein the copolymer comprises about 0.001 mole percent to about 5 mole percent of the d) component.

20. The method of claim 1 wherein the copolymer comprises a d) component that is at least one compound selected from the group consisting of acrylonitrile, styrene, ethylene, butadiene, propylene, isobutene, vinyl acetate, acrylic acid, methacrylic acid, methyl acrylate, methyl methacrylate, ethyl acrylate, butyl acrylate, ethylhexyl acrylate, allyl acetate, maleic acid, maleic anhydride, diethyl maleate, dibutyl maleate, fumaric acid, itaconic acid, dodecenylsuccinic anhydride, vinylsulfonic acid, styrene sulfonic acid and mixtures thereof.

21. The method of claim 20 wherein the copolymer comprises about 0.1 mole percent to about 30 mole percent of the d) component.

22. The method of claim 1, wherein the copolymer has an average molecular weight of about 50,000 g/mol to about 20,000,000 g/mol.

23. The method of claim 1, wherein the copolymer comprises about 3 to about 96 mole percent of component a), about 3 to about 96 mole percent of component b) and 0 to about 75 mole percent of component c).

24. The method of claim 1, wherein the copolymer comprises about 40 to about 80 mole percent component a), about 10 to about 55 mole percent component b) and about 2 to about 30 mole percent component c).

25. The method of claim 1, wherein the hydraulic cement is selected from the group consisting of portland cement, masonry cement, alumina cement, refractory cement, magnesia cement, calcium sulfoaluminate cement, and mixtures thereof.

26. The method of claim 1 further comprising at least one of set accelerators, set retarders, air-entraining agents, defoamers, corrosion inhibitors, strength enhancing agents, fibers, dampproofing admixtures, expansive agents, permeability reducers, pumping aids, fungicidal admixtures, germicidal admixtures, insecticidal admixtures, shrinkage reducing admixtures, aggregates, pozzolans, water retention agents, viscosifying agents, and mixtures thereof. .

27. The method of claim 26 wherein if present, the pozzolan is one of silica fume, reactive silica, granulated ground blast furnace slag, fly ash, calcined clay, and mixtures thereof.

28. The method of claim 26 wherein if present the set accelerator comprises at least one of:

a) a nitrate salt of an alkali metal, alkaline earth metal, or aluminum;

b) a nitrite salt of an alkali metal, alkaline earth metal, or aluminum;

c) a thiocyanate of an alkali metal, alkaline earth metal or aluminum;

d) an alkanolamine;

e) a thiosulphate of an alkali metal, alkaline earth metal, or aluminum;

f) a hydroxide of an alkali metal, alkaline earth metal, or aluminum;

g) a carboxylic acid salt of an alkali metal, alkaline earth metal, or aluminum;

h) a polyhydroxylalkylamine; or

i) a halide salt of an alkali metal or alkaline earth metal.

29. The method of claim 26 wherein if present the set retarder is selected from the group consisting of an oxy-boron compound, lignin, a polyphosphonic acid, a carboxylic acid, a hydroxycarboxylic acid, polycarboxylic acid,

hydroxylated carboxylic acid, fumaric, itaconic, malonic, borax, gluconic, and tartaric acid, lignosulfonates, ascorbic acid, isoascorbic acid, sulphonic acid-acrylic acid copolymer, and their corresponding salts, polyhydroxysilane, polyacrylamide, carbohydrates, petroleum oil mixtures, and mixtures thereof.

30. The method of claim 1 wherein the water to cement ratio is no greater than about 0.45.

31. The method of claim 1 wherein the water to cement ratio is about 0.35 to about 0.44.

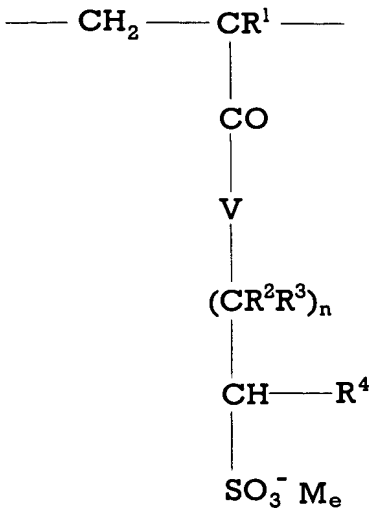
32. The method of claim 1 wherein the copolymer is present in an amount from about 0.001% to about 10.0% based on the dry weight of the hydraulic cement.

33. The method of claim 16 wherein the copolymer of N,N, dimethylacrylamide and 2-acrylamido, 2-methyl propane sulfonic acid is present in an amount from about 0.001% to about 10.0% based on the dry weight of the hydraulic cement.

34. A method of making a reduced fluid loss post-tensioned hydraulic cementitious grout article comprising:

inserting at least one bar member into a channel; securing a first end of the bar member; stretching the bar member; securing a second end of the bar member; introducing into the channel a reduced fluid loss hydraulic cementitious grout composition comprising hydraulic cement, water, and a copolymer, wherein the copolymer comprises at least two components selected from a), b) and c):

wherein a) is the component



(Formula I)

wherein R^1 = is at least one of hydrogen or methyl;

R^2, R^3, R^4 = are each independently hydrogen, aliphatic hydrocarbon radical with 1 to about 6 carbon atoms, or phenyl radical;

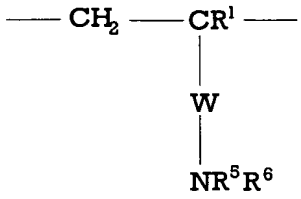
V = NH or oxygen;

M = hydrogen, monovalent metal cation, bivalent metal cation, ammonium, or an organic amino radical;

n = about 1 to about 5;

e = 0.5 or 1;

b) is the component



(Formula II)

wherein W = -CO-, -CO-$(CH_2)_x$-, -CO-NR^2-$(CH_2)_x$-;

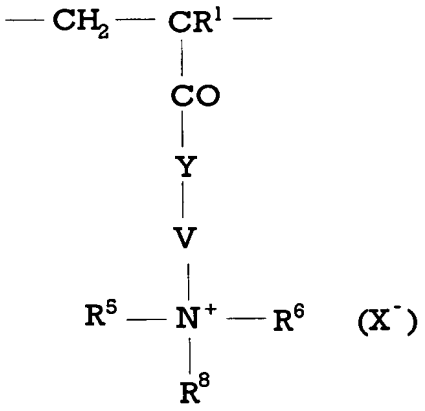
R^1= is at least one of hydrogen or methyl;

R^2= hydrogen, aliphatic hydrocarbon radical with 1 to about 6 carbon-atoms, or phenyl radical;

x = about 1 to about 6;

R^5 and R^6 = are each independently hydrogen, alkyl group containing 1 to about 4 carbon atoms, aliphatic hydrocarbon radical containing 1 to about 20 carbon atoms, alicyclic hydrocarbon radical containing about 5 to about 8 carbon atoms, or aryl radical containing about 6 to about 14 carbon atoms;

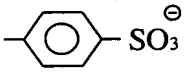
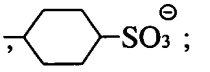
c) is the component



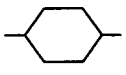
(Formula V)

wherein R^1 = is at least one of hydrogen or methyl;

R^5 and R^6 = are each independently hydrogen, alkyl group containing 1 to about 4 carbon atoms, aliphatic hydrocarbon radical containing 1 to about 20 carbon atoms, alicyclic hydrocarbon radical containing about 5 to about 8 carbon atoms, or aryl radical containing about 6 to about 14 carbon atoms;

R^8 = R^5 or R^6, $-(CH_2)_x-SO_3^{\ominus}$ (M),  ,  ;

Y = O, NH or NR^5;

V = $-(CH_2)_x-$,  ,  ;

X = halogen, C_1- to C_4-alkylsulfate or C_1- to C_4-alkylsulfonate; and

M = hydrogen, monovalent metal cation, bivalent metal cation, ammonium, or an organic amino radical.

35. A reduced fluid loss post-tensioned hydraulic cementitious grout article produced by the method of claim 34.

36. The reduced fluid loss post-tensioned hydraulic cementitious grout article of claim 35, wherein the reduced fluid loss post-tensioned hydraulic cementitious grout article is a reduced fluid loss post-tensioned tendon.

37. A concrete member comprising the reduced fluid loss post-tensioned hydraulic cementitious grout article of claim 35.

38. The method of claim 34, wherein the bar member is at least one of bars, rods, strands, or cables.

39. The method of claim 34, wherein if R^5 or R^6 is an aliphatic hydrocarbon radical at least one aliphatic hydrocarbon radical of the copolymer comprises a substituent that is at least one of a hydroxyl group, alkyl group containing 1 to about 6 carbon atoms, carboxyl group or sulfonic group.

40. The method of claim 34, wherein if R^5 or R^6 is an alicyclic hydrocarbon radical at least one alicyclic hydrocarbon radical of the copolymer comprises a substituent that is at least one of a hydroxyl group, alkyl group containing 1 to about 6 carbon atoms, carboxyl group or sulfonic group.

41. The method of claim 34, wherein if R^5 or R^6 is an aryl radical at least one aryl radical of the copolymer comprises a substituent that is at least one of a hydroxyl group, alkyl group containing 1 to about 6 carbon atoms, carboxyl group or sulfonic group.

42. The method of claim 34, wherein if R^2, R^3, or R^4 is a phenyl radical at least one phenyl radical of the copolymer comprises a substituent that is at least one of a hydroxyl group, alkyl group containing 1 to about 6 carbon atoms, carboxyl group or sulfonic group.

43. The method of claim 34, wherein if M is an organic amino radical at least one organic amino radical of the copolymer comprises a substituent that is at least one of a hydroxyl group, alkyl group containing 1 to about 6 carbon atoms, carboxyl group or sulfonic group.

44. The method of claim 34, wherein if M is an organic amino radical at least one organic amino radical of the copolymer comprises substituted ammonium groups derived from the group consisting of primary, secondary or tertiary C_1 to C_{20} alkylamines; primary, secondary or tertiary C_1 to C_{20} alkanolamines; primary, secondary or tertiary C_5 to C_8 cycloalkylamines; and, primary, secondary or tertiary C_6 to C_{14} arylamines.

45. The method of claim 34, wherein if M is a monovalent metal cation the monovalent metal cation is at least one of sodium, lithium, or potassium ions.

46. The method of claim 34, wherein if M is a bivalent metal cation the bivalent metal cation is at least one of calcium, or magnesium ions.

47. The method of claim 34, wherein X is an anion of at least one of chlorine, bromine, sulfate or methyl sulfate.

48. The method of claim 34 wherein the sulfonic acid of formula I is replaced with at least one of methallylsulfonic acid or allyl sulfonic acid.

49. The method of claim 34, wherein the copolymer includes at least one of N,N, dimethylacrylamide and 2-acrylamido, 2-methyl propane sulfonic acid.

50. The method of claim 34 wherein the copolymer comprises a d) component that is at least one compound selected from the group consisting of diacrylate ester of ethylene glycol, dimethylacrylate ester of ethylene glycol, polypropylene glycol, block copolymers of ethylene glycol, block

copolymers of propylene glycol, diallyl ether of ethylene glycol, diallyl ether of propylene glycol, divinyl ether of ethylene glycol, divinyl ether of propylene glycol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, N, N'-methylene-bis-acrylamide, N,N'-methylene-bis-methacrylamide, trimethylolpropane, triacrylate, triallyl isocyanurate, and mixtures thereof.

51. The method of claim 50 wherein the copolymer comprises about 0.0001 mole percent to about 50 mole percent of the d) component.

52. The method of claim 50 wherein the copolymer comprises about 0.001 mole percent to about 5 mole percent of the d) component.

53. The method of claim 34 wherein the copolymer comprises a d) component that is at least one compound selected from the group consisting of acrylonitrile, styrene, ethylene, butadiene, propylene, isobutene, vinyl acetate, acrylic acid, methacrylic acid, methyl acrylate, methyl methacrylate, ethyl acrylate, butyl acrylate, ethylhexyl acrylate, allyl acetate, maleic acid, maleic anhydride, diethyl maleate, dibutyl maleate, fumaric acid, itaconic acid, dodecenylsuccinic anhydride, vinylsulfonic acid, styrene sulfonic acid and mixtures thereof.

54. The method of claim 53 wherein the copolymer comprises about 0.1 mole percent to about 30 mole percent of the d) component.

55. The method of claim 34, wherein the copolymer has an average molecular weight of about 50,000 g/mol to about 20,000,000 g/mol.

56. The method of claim 34, wherein the copolymer comprises about 3 to about 96 mole percent of component a), about 3 to about 96 mole percent of component b) and 0 to about 75 mole percent of component c).

57. The method of claim 34, wherein the copolymer comprises about 40 to about 80 mole percent component a), about 10 to about 55 mole percent component b) and about 2 to about 30 mole percent component c).

58. The method of claim 34, wherein the hydraulic cement is selected from the group consisting of portland cement, masonry cement, alumina cement, refractory cement, magnesia cement, calcium sulfoaluminate cement, and mixtures thereof.

59. The method of claim 34 further comprising at least one of set accelerators, set retarders, air-entraining agents, defoamers, corrosion inhibitors, strength enhancing agents, fibers, dampproofing admixtures, expansive agents, permeability reducers, pumping aids, fungicidal admixtures, germicidal admixtures, insecticidal admixtures, shrinkage reducing admixtures, aggregates, pozzolans, water retention agents, viscosifying agents, and mixtures thereof.

60. The method of claim 59 wherein if present, the pozzolan is one of silica fume, reactive silica, granulated blast furnace slag, fly ash, calcined clay, and mixtures thereof.

61. The method of claim 59 wherein if present the accelerator comprises at least one of:

a) a nitrate salt of an alkali metal, alkaline earth metal, or aluminum;

b) a nitrite salt of an alkali metal, alkaline earth metal, or aluminum;

c) a thiocyanate of an alkali metal, alkaline earth metal or aluminum;

d) an alkanolamine;

e) a thiosulphate of an alkali metal, alkaline earth metal, or aluminum;

f) a hydroxide of an alkali metal, alkaline earth metal, or aluminum;

g) a carboxylic acid salt of an alkali metal, alkaline earth metal, or aluminum;

h) a polyhydroxylalkylamine; or

i) a halide salt of an alkali metal or alkaline earth metal.

62. The method of claim 59 wherein if present the retarder is selected from the group consisting of an oxy-boron compound, lignin, a polyphosphonic acid, a carboxylic acid, a hydroxycarboxylic acid, polycarboxylic acid, hydroxylated carboxylic acid, fumaric, itaconic, malonic, borax, gluconic, and tartaric acid, lignosulfonates, ascorbic acid, isoascorbic acid, sulphonic acid-acrylic acid copolymer, and their corresponding salts, polyhydroxysilane, polyacrylamide, carbohydrates, petroleum oil mixtures, and mixtures thereof.

63. The method of claim 34 wherein the water to cement ratio is no greater than about 0.45.

64. The method of claim 34 wherein the water to cement ratio is about 0.35 to about 0.44..

65. The method of claim 34 wherein the copolymer is present in an amount from about 0.001% to about 10.0% based on the dry weight of the hydraulic cement.

66. The method of claim 49 wherein the copolymer of N,N, dimethylacrylamide and 2-acrylamido, 2-methyl propane sulfonic acid is present in an amount from about 0.001% to about 10.0% based on the dry weight of the hydraulic cement.